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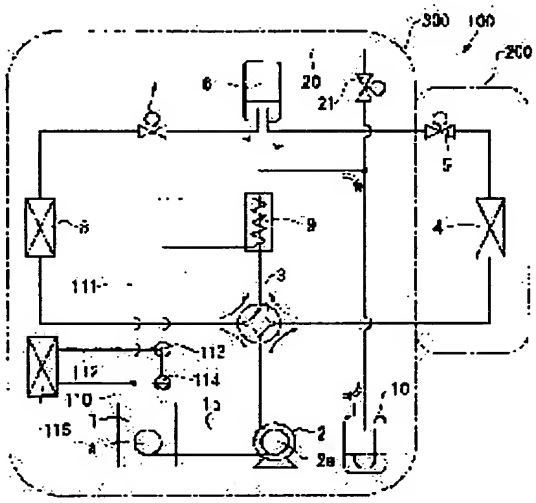
(54) REFRIGERATION CYCLE UNIT, AND HEAT-PUMP TYPE AIR CONDITIONER

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent liquid compression when a compressor 2 is started after equalization, without enlarging a size of an accumulator 10.

SOLUTION: This unit is provided with a gas-liquid separating means 6 for a refrigerant between the first heat-exchangers 4, 8 and pressure reducing means 5, 7, an equalization circuit 20 for making gaseous refrigerant separated in the gas-liquid separating means 6 flow in a low pressure portion from an outlet side of the pressure reducing means 5, 7 to a suction side of the compressor 2, and an opening and closing means 21 for opening and closing the equalization circuit 20, and the opening and closing means 21 is opened to conduct equalization for the refrigeration cycle when an operation of the compressor 2 is stopped. The gas-liquid separating means for the refrigerant is provided in a high-pressure side by this manner, only the separated high-pressure side refrigerant separated therein is removed to a low-pressure side, and the equalization is thereby realized without increasing a liquid refrigerant amount in the low-pressure side. The liquid compression is prevented thereby when the compressor 2 is started after equalization, without enlarging the size of the accumulator 10.



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CLAIMS

[Claim(s)]

[Claim 1] The compressor (2) which compresses and carries out the regurgitation of the refrigerant, and the 1st heat exchanger which makes said refrigerant condense (4 8), In the refrigerating cycle equipment which connected annularly a reduced pressure means (5 7) to decompress said refrigerant, the 2nd heat exchanger (4 8) which evaporates said refrigerant, and the accumulator (10) which carries out vapor liquid separation of said refrigerant, and stores it, and was formed Between said 1st heat exchanger (4 8) and said reduced pressure means (5 7), the vapor-liquid-separation means of a refrigerant (6), The equalization circuit which circulates the gas refrigerant separated with the vapor-liquid-separation means (6) to a part for the depression from said reduced pressure means (5 7) outlet side to the inlet side of said compressor (2) (20), Refrigerating cycle equipment characterized by opening said closing motion means (21) and carrying out equalization of the inside of said refrigerating cycle equipment when a closing motion means (21) to open and close a circuit is established in the equalization circuit (20) and operation of said compressor (2) is suspended.

[Claim 2] Refrigerating cycle equipment according to claim 1 characterized by using a receiver for said vapor-liquid-separation means (6).

[Claim 3] The heat pump type air conditioner which is equipped with refrigerating cycle equipment according to claim 1 or 2, and is characterized by said 1st and 2nd heat exchanger (4 8) being indoor heat exchanger (4) and an outdoor heat exchanger (8).

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention applies and is suitable for the heat pump type air conditioner which is related with the equalization in the equipment when stopping especially equipment about the refrigerating cycle equipment and the heat pump type air conditioner which perform cooling and heating of a fluid of air, water, etc., cools and heats air, and performs the air conditioning in a sitting-room.

[0002]

[Description of the Prior Art] Conventionally, when operation of a refrigerating cycle is stopped, there is refrigerating cycle equipment with which the equalization circuit which is made to short-circuit high-pressure piping and low voltage piping, and cancels the differential pressure in equipment is prepared. Drawing 2 shows the configuration of the conventional heat pump type air conditioner by the mimetic diagram as 1 operation gestalt of such refrigerating cycle equipment.

[0003] 2 is a compressor which compresses and carries out the regurgitation of the refrigerant, and, as for the compressed refrigerant, the refrigerant circulation direction to a heat exchanger is changed in the time of air conditioning and heating by the four way valve 3. The receiver which indoor heat exchanger and 5 carry out the expansion valve at the time of air conditioning, and, as for 4, 6 carries out vapor liquid separation of the refrigerant, and stores, and 7 are accumulators which the expansion valve at the time of heating and 8 carry out an outdoor heat exchanger, and 10 carries out vapor liquid separation of the refrigerant, and are stored, a gas refrigerant is inhaled by the compressor 2 from here, and circulation accomplishes them.

[0004] Incidentally, the sign which 1 is an engine for driving, in addition omitted explanation corresponds with the number given to the operation gestalt mentioned later. And 21 is the equalization circuit which short-circuits high-pressure piping and low voltage piping, and 21 is a closing motion valve which opens and closes that equalization circuit 20, when stopping operation of a refrigerating cycle, it opens this closing motion valve 21, and performs equalization.

[0005]

[Problem(s) to be Solved by the Invention] However, since the liquid cooling intermediation in piping of the high-tension side etc. flows into the low-tension side when this equalization is performed, if the liquid cooling intermediation capacity in an accumulator is exceeded, in case liquid cooling intermediation will overflow, it will enter into the inlet side of a compressor and then a refrigerating cycle will be started, a compressor inhales liquid cooling intermediation, and serves as liquid compression, and there is a problem of causing failure.

[0006] By setting up the accumulator which whose amount of refrigerants to enclose increases when especially indoor heat exchanger and an outdoor heat exchanger separate and are installed, and is generous to the amount of refrigerants, although correspondence is possible, problems, such as enlargement, a cost rise, etc. of equipment, will arise.

[0007] This invention is accomplished in view of the above-mentioned conventional problem, and the purpose is in offering the refrigerating cycle equipment and the heat pump type air conditioner which can prevent liquid compression at the time of compressor starting after equalization, without enlarging an accumulator.

[0008]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the following technical means are adopted in this invention. The compressor which compresses and carries out the regurgitation of the refrigerant in invention according to claim 1 (2), The 1st heat exchanger (4 8) which makes a refrigerant condense, and a reduced pressure means to decompress a refrigerant (5 7), In the refrigerating cycle equipment which connected annularly the 2nd heat exchanger (4 8) which evaporates a refrigerant, and the accumulator (10) which carries out vapor liquid separation of the refrigerant, and stores it, and was formed Between the 1st heat exchanger (4 8) and a reduced pressure means (5 7), the vapor-liquid-separation means of a refrigerant (6), The equalization circuit which circulates the gas refrigerant separated with the vapor-liquid-separation means (6) to a part for the depression from a reduced pressure means (5 7) outlet side to the inlet side of a compressor (2) (20), When a closing motion means (21) to open and close a circuit is established in the equalization circuit (20) and operation of a compressor (2) is suspended, it is characterized by opening a closing motion means (21) and

carrying out equalization of the inside of refrigerating cycle equipment.
[0009] This prepares the vapor-liquid-separation part of a refrigerant in the high-tension side, and if only the high pressure gas refrigerant separated there is extracted to the low-tension side, it can perform equalization, without increasing the amount of liquid refrigerants of the low-tension side. Thereby, the liquid compression at the time of compressor starting after equalization can be prevented, without enlarging an accumulator.
[0010] In invention according to claim 2, it is characterized by using a receiver for a vapor-liquid-separation means (6). This invention can perform equalization in refrigerating cycle equipment paying attention to the point which can be primarily used as a liquid cooling intermediation reservoir in carrying out vapor liquid separation of the refrigerant with a receiver by extracting the high pressure gas refrigerant of the receiver upper part to the low-tension side. It seems that equalization does not increase the amount of liquid refrigerants of the low-tension side since vapor liquid separation is carried out and liquid cooling intermediation is accumulated in a receiver although liquid cooling intermediation of a high tension side flows into a receiver then.
[0011] The liquid compression at the time of compressor starting after equalization can be prevented only by making the takeoff connection of the high tension side of an equalization circuit (20) into the receiver upper part by this using the same refrigerating cycle configuration equipment as usual, without enlarging an accumulator.
[0012] In invention according to claim 3, refrigerating cycle equipment according to claim 1 or 2 is used for a heat pump type air conditioner, and it is characterized by using the 1st and 2nd heat exchanger (4 8) as indoor heat exchanger (4) and an outdoor heat exchanger (8). Thereby, it can consider as the air conditioner which does not cause liquid compression at the time of compressor starting after equalization, either, without enlarging an accumulator.
[0013] In addition, the sign in the parenthesis given to each above-mentioned means shows correspondence relation with the concrete means given in an operation gestalt mentioned later.
[0014]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained based on drawing. Drawing 1 is the mimetic diagram showing the configuration of the heat pump type air conditioner 100 in 1 operation gestalt of this invention. Although this operation gestalt is driven with the engine (for example, diesel power plant) 1 of a water cooling type, this heat pump type air conditioner 100 is used as an air conditioner of a fixed mold or a car loading mold and the air conditioning of indoor or the vehicle interior of a room can be carried out, this operation gestalt describes as what was applied to the fixed mold.
[0015] The heat pump type air conditioner 100 connects between each refrigerating cycle device for refrigerant piping, is constituted, at the time of inside-of-a-house heating, circulates a refrigerant in order of the compressor 2 -> four-way-valve 3 -> indoor heat exchanger 4 -> interior unit motor-operated valve 5 -> receiver 6 (vapor-liquid-separation means) -> exterior unit motor-operated valve 7 -> outdoor heat exchanger 8 -> four-way-valve 3 -> refrigerant heater 9 -> accumulator 10 -> compressor 2 (continuous-line arrow head), and is heating.
[0016] Moreover, at the time of inside-of-a-house air conditioning, in order of the compressor 2 -> four-way-valve 3 -> outdoor heat exchanger 8 -> exterior unit motor-operated valve 7 -> receiver 6 -> interior unit motor-operated valve 5 -> indoor heat exchanger 4 -> four-way-valve 3 -> refrigerant heater 9 -> accumulator 10 -> compressor 2, a refrigerant is circulated (broken-line arrow head) and air-conditioned.
[0017] Indoor heat exchanger 4 functions as the 1st heat exchanger which is a condenser at the time of heating, and functions as the 2nd heat exchanger which is an evaporator at the time of air conditioning. Moreover, an outdoor heat exchanger 8 functions as the 2nd heat exchanger which is an evaporator at the time of heating, and functions as the 1st heat exchanger which is a condenser at the time of air conditioning. And at the time of heating, the exterior unit motor-operated valve 7 functions as an expansion valve which is a reduced pressure means to decompress a refrigerant, and the interior unit motor-operated valve 5 functions as an expansion valve which is a reduced pressure means at the time of air conditioning.
[0018] An engine 1 transmits driving force to pulley 2a prepared in the compressor 2 by V belt

1b twisted around crank-pulley 1a. And between pulley 2a and a compressor 2, the electromagnetic clutch (not shown) is prepared as a driving force intermittence means to transmit or intercept the driving force transmitted to pulley 2a to a compressor 2.
[0019] Moreover, the oil separator (not shown) of the common knowledge which separates oil from the refrigerant which the compressor 2 breathed out is prepared in refrigerant piping connected to the discharge side (four-way-valve 3 side) of a compressor 2, and the oil separated by the oil separator is returned through an oil return tube (not shown) by the differential pressure before and behind a compressor 2 into the path of refrigerant piping connected to the inlet side (accumulator 10 side) of a compressor 2.
[0020] The cooling water path which 110 is a cooling water circuit and is not illustrated for being formed in the body of an engine 1 and cooling an engine 1, The 1st cooling water circuit 111 which flows the refrigerant heater 9 which is a refrigerant heating unit, the cooling water selector valve 113, and a cooling water pump 114 one by one from this cooling water path outlet, and returns to the above-mentioned cooling water path inlet port, A radiator 115, the cooling water selector valve 113, and a cooling water pump 114 are flowed one by one from the above-mentioned cooling water path outlet, and it consists of 2nd cooling water circuits 112 which return to the above-mentioned cooling water path inlet port.
[0021] the electromagnetism to which a cooling water pump 114 is an electric rotary pump, and the cooling water selector valve 113 changes the 1st cooling water circuit 111 and the 2nd cooling water circuit 112 here -- it is a selector valve. Moreover, a radiator 115 is the heat exchanger of the common knowledge which carries out heat exchange of cooling water and the open air, the refrigerant heater 9 is a heat exchanger of a double tubing type which consists of a metal etc., and the heat exchange of cooling water and a refrigerant has become possible. Moreover, the entrance and each part material 9,113-115 of the above-mentioned cooling water path are connected with the rubber hose etc.
[0022] In the heat pump type air conditioner 100 which has the above-mentioned configuration, among each component, indoor heat exchanger 4 and the interior unit motor-operated valve 5 constitute an interior unit 200, and are installed in an indoor proper place, and other things constitute an exterior unit 300 and are installed in the outdoor proper place.
[0023] And the heat pump type air conditioner 100 has a control unit (not shown) as a control means which consists of an electronic circuitry etc., and this control unit inputs the information from the controller formed in the interior of a room which is not illustrated, the outside-air-temperature sensor which is not illustrated, a refrigerant temperature sensor, a coolant temperature sensor, etc., and it carries out actuation control of an interior unit 200 and the exterior unit 300.
[0024] Next, the configuration of the important section of this operation gestalt is explained. The receiver 6 is formed as a vapor-liquid-separation means of a refrigerant between indoor heat exchanger 4 and the outdoor heat exchanger 8, the interior unit motor-operated valve 5, and the exterior unit motor-operated valve 7. And the refrigerant piping part as an equalization circuit 20 which circulates the gas refrigerant with which is separated within the receiver 6 and the upper part is covered to a part for the depression from the outlet side of the interior unit motor-operated valve 5 at the time of air conditioning and the outlet side of the exterior unit motor-operated valve 7 at the time of heating to the inlet side of a compressor 2 is prepared.
[0025] The between to the upstream of an accumulator 10 is connected for refrigerant piping that the time of a receiver's 6 top-face section, and the time of air conditioning and heating has so that [liquid cooling intermediation] it may be accumulated in fact from the lower stream of a river of a four way valve 3 where the flow direction of a refrigerant becomes the same. Moreover, the solenoid valve 21 for equalization as a closing motion means of a circuit is formed in the equalization circuit 20.
[0026] Next, actuation of this operation gestalt is explained based on the above-mentioned configuration. When the electric power supply of the control unit is carried out to the heat pump type air conditioner 100, it performs either control processing at the time of heating operation, or control processing at the time of air conditioning operation based on the information from the controller which is not illustrated.

[0027] First, the actuation at the time of heating operation is explained. For example, if the controller which is not illustrated is heating switched off and ON signal is inputted into a control unit when outside air temperature is low, a control unit will perform control processing at the time of heating operation. A control device starts an engine 1 and drives a compressor 2 while it changes a four way valve 3 to a heating side (continuous line). Moreover, while making full open the interior unit motor-operated valve 5, the exterior unit motor-operated valve 7 is adjusted to the opening which functions as an expansion valve.
[0028] After heating by the hot gas refrigerant which came out of the compressor 2 passing along a four way valve 3, and condensing by indoor heat exchanger 4, Vapor liquid separation is carried out with a receiver 6, liquid cooling intermediation is decompressed by the exterior unit motor-operated valve 7, it evaporates in an outdoor heat exchanger 8, and a four way valve 3 is passage and continued again. With the refrigerant heater 9 After being heated by heat exchange with the cooling water which collected engine exhaust heat, vapor liquid separation is carried out by the accumulator 10, and a gas refrigerant returns to a compressor 2.
[0029] According to starting of an engine 1, a cooling water pump 114 is also started and the cooling water selector valve 113 is changed in the direction to which cooling water flows in the 1st cooling water circuit 111. After it flows the cooling water path in an engine 1 and carries out endoergic [of the engine exhaust heat], the cooling water fed with the cooling water pump 114 goes into the refrigerant heater 9, and heat exchange of it is carried out to the refrigerant which evaporated in the outdoor heat exchanger 8, and it heats a refrigerant here. Then, it returns from the cooling water selector valve 113 to a cooling water pump 114, and is again sent to the cooling water path in an engine 1.
[0030] Thus, since cooling water circulates, exhaust heat of an engine 1 is collected by cooling water, is used for heating of a refrigerant with the refrigerant heater 9, and becomes a part of heating heat source of the heat pump type air conditioner 100.
[0031] Next, the actuation at the time of air conditioning operation is explained. For example, if the controller which is not illustrated is air conditioning switched off and ON signal is inputted into a control unit when outside air temperature is high, a control unit will perform control processing at the time of air conditioning operation. A control device starts an engine 1 and drives a compressor 2 while it changes a four way valve 3 to an air conditioning side (broken line). Moreover, while making full open the exterior unit motor-operated valve 7, the interior unit motor-operated valve 5 is adjusted to the opening which functions as an expansion valve.
[0032] After air-conditioning by the hot gas refrigerant which came out of the compressor 2 passing along a four way valve 3, and condensing it by the outdoor heat exchanger 8, vapor liquid separation being carried out with a receiver 6, and liquid cooling intermediation being decompressed by the interior unit motor-operated valve 5, and evaporating in an outdoor heat exchanger 8, again, and it is continuously sent to an accumulator 10 from the refrigerant heater 9, vapor liquid separation is carried out by the accumulator 10, and a gas refrigerant returns a four way valve 3 to a compressor 2.
[0033] According to starting of an engine 1, a cooling water pump 114 is also started and the cooling water selector valve 113 is changed in the direction to which cooling water flows in the 2nd cooling water circuit 112. It goes into a radiator 115, after the cooling water fed with the cooling water pump 114 flowing the cooling water path in an engine 1 and carrying out endoergic [of the engine exhaust heat]. Then, it returns from the cooling water selector valve 113 to a cooling water pump 114, and is again sent to the cooling water path in an engine 1.
[0034] Thus, since cooling water circulates, exhaust heat of an engine 1 is collected by cooling water, with a radiator 115, carries out heat exchange to the open air, and radiates heat. And when it carries out as soon as it stopped the engine 1 or turned off driving force with the electromagnetic clutch, and a compressor 2 is stopped and the refrigerant circulation in a refrigerating cycle is suspended by an above-mentioned configuration and actuation, the solenoid valve 21 for equalization is opened and equalization of the inside of refrigerating cycle equipment is carried out.
[0035] Thus, the vapor-liquid-separation means 6 of a refrigerant is formed in the high-tension side, and equalization is performed by extracting only the high pressure gas refrigerant separated

there to the low-tension side, without increasing the amount of liquid refrigerants of the low-tension side. Thereby, the liquid compression at the time of compressor 2 starting after equalization can be prevented, without enlarging an accumulator 10.
[0036] Moreover, the receiver is used for the vapor-liquid-separation means 6. The liquid compression at the time of compressor starting after equalization can be prevented only by making the takeoff connection of the high tension side of the equalization circuit 20 into the receiver upper part by this using the same refrigerating cycle configuration equipment as usual, without enlarging an accumulator.
[0037] Moreover, such an equalization circuit 20 is used for the heat pump type air conditioner which used the 1st and 2nd heat exchanger as indoor heat exchanger 4 and an outdoor heat exchanger 8. Thereby, it can consider as the air conditioner which does not cause liquid compression at the time of compressor 2 starting after equalization, either, without enlarging an accumulator 10.
[0038] (Other operation gestalten) With the above-mentioned operation gestalt, although the receiver is used for the vapor-liquid-separation means 6, this invention may be prepared as vapor-liquid-separation equipment equipment of not only this but equalization circuit 20 dedication. Moreover, although it was the heat pump type air conditioner of an engine drive, you may apply to refrigerant compression equation refrigerating cycles other than a heat pump type air conditioner. Moreover, compressors 2 may be things other than engine drives, such as an electrically-driven compressor, and may be applied to the hot-water supply equipment which heats brine (heat exchange medium), such as water and the antifreezing solution.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the mimetic diagram showing the configuration of the heat pump type air conditioner in 1 operation gestalt of this invention.
[Drawing 2] It is the mimetic diagram showing the configuration of the heat pump type air conditioner in 1 conventional operation gestalt.
[Description of Notations]
2 Compressor
4 Indoor Heat Exchanger (1st Heat Exchanger at the Time of Heating, 2nd Heat Exchanger at the Time of Air Conditioning)
5 Interior Unit Motor-operated Valve (Reduced Pressure Means at the Time of Air Conditioning)
6 Receiver (Vapor-Liquid-Separation Means)
7 Exterior Unit Motor-operated Valve (Reduced Pressure Means at the Time of Heating)
8 Outdoor Heat Exchanger (1st Heat Exchanger at the Time of Air Conditioning, 2nd Heat Exchanger at the Time of Heating)
10 Accumulator
30 Equalization Circuit

31 Solenoid Valve for Equalization (Closing Motion Means)

[Translation done.]

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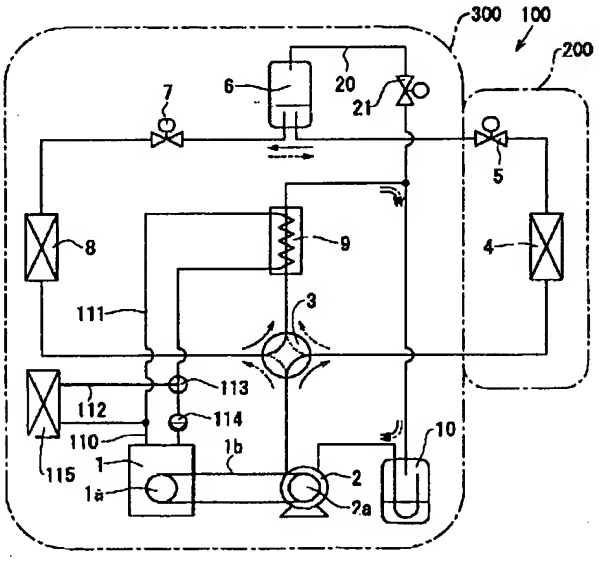
(54)【発明の名称】　冷凍サイクル装置及びヒートポンプ式空調装置

(57)【要約】
【課題】　アキュームレータ１０を大型化することなく、均圧後の圧縮機２起動時に液圧縮を防止できる冷凍サイクル装置及びヒートポンプ式空調装置を提供する。
【解決手段】　第１熱交換器４、８と減圧手段５、７との間に冷媒の気液分離手段６と、その気液分離手段６にて分離されたガス冷媒を減圧手段５、７出口側から圧縮機２の吸入側までの低圧部分に流通させる均圧回路２０と、その均圧回路２０を開閉する開閉手段２）とを設け、圧縮機２の運転を停止した場合、開閉手段２１を開いて冷凍サイクル装置内を均圧させる。これは、高圧側に冷媒の気液分離部分を設け、そこで分離された高圧ガス冷媒だけを低圧側に抜けば、低圧側の液冷媒量を増やすことなく均圧が行えることとなる。これにより、アキュームレータ１０を大型化することなく、均圧後の圧縮機起動時の液圧縮を防止することができる。



【特許請求の範囲】
【請求項１】　冷媒を圧縮して吐出する圧縮機（２）と、
前記冷媒を凝縮させる第１熱交換器（４、８）と、
前記冷媒を減圧する減圧手段（５、７）と、
前記冷媒を蒸発させる第２熱交換器（４、８）と、
前記冷媒を気液分離して蓄えるアキュームレータ（１０）とを環状に接続して形成された冷凍サイクル装置において、
前記第１熱交換器（４、８）と前記減圧手段（５、７）との間に冷媒の気液分離手段（６）と、
その気液分離手段（６）にて分離されたガス冷媒を前記減圧手段（５、７）出口側から前記圧縮機（２）の吸入側までの低圧部分に流通させる均圧回路（２０）と、
その均圧回路（２０）内に回路を開閉する開閉手段（２１）とを設け、
前記圧縮機（２）の運転を停止した場合、前記開閉手段（２１）を開いて前記冷凍サイクル装置内を均圧させることを特徴とする冷凍サイクル装置。
【請求項２】　前記気液分離手段（６）にレシーバを用いたことを特徴とする請求項1に記載の冷凍サイクル装置。
【請求項３】　請求項１または請求項２に記載の冷凍サイクル装置を備え、前記第１、第２熱交換器（４、８）とは室内熱交換器（４）及び室外熱交換器（８）であることを特徴とするヒートポンプ式空調装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、空気、水等の流体の冷却や加熱を行なう冷凍サイクル装置及びヒートポンプ式空調装置に関し、特に装置を停止させた時の装置内の均圧に関するものであり、空気を冷却・加熱して居室内の冷暖房を行うヒートポンプ式空調装置等に適用して好適である。
【０００２】
【従来の技術】従来より、冷凍サイクルの運転を停止させた場合、高圧配管と低圧配管とを短絡させて装置内の圧力差を解除する均圧回路が設けられている冷凍サイクル装置がある。図2は、そのような冷凍サイクル装置の一実施形態として、従来のヒートポンプ式空調装置の構成を模式図で示す。
【０００３】2は冷媒を圧縮して吐出する圧縮機であり、圧縮された冷媒は四方弁３で冷房時と暖房時とで熱交換器への冷媒流通方向が換えられる。４は室内熱交換器、５は冷房時の膨張弁、６は冷媒を気液分離して蓄えるレシーバ、７は暖房時の膨張弁、８は室外熱交換器、１０は冷媒を気液分離して蓄えるアキュームレータであり、ここからガス冷媒が圧縮機２に吸入されて循環が成される。
【０００４】因みに、１は駆動するためのエンジンで、その他説明を省いた符号は後述する実施形態に付した号と対応するものである。そして、２１が高圧配管と低圧配管とを短絡させる均圧回路であり、２１はその均圧回路２０を開閉する開閉弁であり、冷凍サイクルの運転を停止させた時にこの開閉弁２１を開いて均圧を行うものである。
【０００５】
【発明が解決しようとする課題】しかし、この均圧を行った際に高圧側の配管内等の液冷媒が低圧側に流れ込むため、アキュームレータでの液冷媒容量を越えると液冷媒がオーバーフローして圧縮機の吸入側に入り込み、次に冷凍サイクルを起動する際に圧縮機が液冷媒を吸入して液圧縮となり故障を引き起こすという問題がある。
【０００６】特に室内熱交換器と室外熱交換器とが離れて設置されるような場合には封入する冷媒量が多くなり、その冷媒量に対して余裕のあるアキュームレータを設定することで対応は可能であるが、装置の大型化・コストアップ等の問題が生じてしまう。
【０００７】本発明は、上記従来の問題に鑑みて成されたものであり、その目的は、アキュームレータを大型化することなく、均圧後の圧縮機起動時に液圧縮を防止できる冷凍サイクル装置及びヒートポンプ式空調装置を提供することにある。
【０００８】
【課題を解決するための手段】上記目的を達成するため、本発明では以下の技術的手段を採用する。請求項１に記載の発明では、冷媒を圧縮して吐出する圧縮機（２）と、冷媒を凝縮させる第１熱交換器（４、８）と、冷媒を減圧する減圧手段（５、７）と、冷媒を蒸発させる第２熱交換器（４、８）と、冷媒を気液分離して蓄えるアキュームレータ（１０）とを環状に接続して形成された冷凍サイクル装置において、第１熱交換器（４、８）と減圧手段（５、７）との間に冷媒の気液分離手段（６）と、その気液分離手段（６）にて分離されたガス冷媒を減圧手段（５、７）出口側から圧縮機（２）の吸入側までの低圧部分に流通させる均圧回路（２０）と、その均圧回路（２０）内に回路を開閉する開閉手段（２１）とを設け、圧縮機（２）の運転を停止した場合、開閉手段（２１）を開いて冷凍サイクル装置内を均圧させることを特徴とする。
【０００９】これは、高圧側に冷媒の気液分離部分を設け、そこで分離された高圧ガス冷媒だけを低圧側に抜けば、低圧側の液冷媒量を増やすことなく均圧が行えることとなる。これにより、アキュームレータを大型化することなく、均圧後の圧縮機起動時の液圧縮を防止することができる。
【００１０】請求項２に記載の発明では、気液分離手段（６）にレシーバを用いたことを特徴とする。本発明はそもそも、レシーバで冷媒が気液分離されるうえ液冷媒溜めとして利用できる点に着目したものであり、レシー

バ上部の高圧ガス冷媒を低圧側に抜くことで冷凍サイクル装置内の均圧を行うことができる。その時、高圧側の液冷媒はレシーバに流れ込むが、気液分離されて液冷媒はレシーバ内に溜められるため、均圧によって低圧側の液冷媒量を増やすようなことがない。

【００１１】これにより、従来と同様の冷凍サイクル構成機器を用いて均圧回路（２０）の高圧側の取り出し部をレシーバ上部とするだけで、アキュームレータを大型化することなく、均圧後の圧縮機起動時の液圧縮を防止することができる。

【００１２】請求項３に記載の発明では、請求項１または請求項２に記載の冷凍サイクル装置をヒートポンプ式空調装置に用い、第１、第２熱交換器（４、８）を室内熱交換器（４）及び室外熱交換器（８）としたことを特徴とする。これにより、アキュームレータを大型化することなく、均圧後の圧縮機起動時にも液圧縮を起こすことのない空調装置とすることができる。

【００１３】尚、上記各手段に付した括弧内の符号は、後述する実施形態記載の具体的手段との対応関係を示すものである。

【００１４】

【発明の実施の形態】以下、本発明の実施の形態を図に基づいて説明する。図１は、本発明の一実施形態におけるヒートポンプ式空調装置１００の構成を示す模式図である。本実施形態は、水冷式のエンジン（例えばディーゼルエンジン）１によって駆動されるもので、このヒートポンプ式空調装置１００は定置型或いは車両搭載型の空調装置として用いられ、屋内や車室内を冷暖房することができるが、本実施形態では定置型に適用したものとして述べる。

【００１５】ヒートポンプ式空調装置１００は、各冷凍サイクル機器間を冷媒配管で接続して構成され、屋内暖房時には、圧縮機２→四方弁３→室内熱交換器４→室内機電動弁５→レシーバ６（気液分離手段）→室外機電動弁７→室外熱交換器８→四方弁３→冷媒加熱器９→アキュームレータ１０→圧縮機２の順に冷媒を流通（実線矢印）させて暖房している。

【００１６】また、屋内冷房時には、圧縮機２→四方弁３→室外熱交換器８→室外機電動弁７→レシーバ６→室内機電動弁５→室内熱交換器４→四方弁３→冷媒加熱器９→アキュームレータ１０→圧縮機２の順に冷媒を流通（破線矢印）させて冷房している。

【００１７】室内熱交換器４は、暖房時には凝縮器である第１熱交換器として機能し、冷房時には蒸発器である第２熱交換器として機能する。また、室外熱交換器８は、暖房時には蒸発器である第２熱交換器として機能し、冷房時には凝縮器である第１熱交換器として機能する。そして、暖房時には、室外機電動弁７が冷媒を減圧する減圧手段である膨張弁として機能し、冷房時には、室内機電動弁５が減圧手段である膨張弁として機能する。

【００１８】エンジン１は、クランクプーリ１ａに巻き付けられたＶベルト１ｂにより圧縮機２に設けられたプーリ２ａに駆動力を伝達するようになっている。そして、プーリ２ａと圧縮機２との間には、プーリ２ａに伝達された駆動力を圧縮機２に伝達または遮断する駆動力断続手段として電磁クラッチ（図示せず）が設けられている。

【００１９】また、圧縮機２の吐出側（四方弁３側）に接続された冷媒配管には、圧縮機２が吐出した冷媒からオイルを分離する周知のオイルセパレータ（図示せず）が設けられており、オイルセパレータで分離されたオイルはオイルリターンチューブ（図示せず）を介して、圧縮機２の吸入側（アキュームレータ１０側）に接続された冷媒配管の経路中に圧縮機２前後の差圧により戻されるようになっている。

【００２０】１１０は冷却水回路であり、エンジン１の本体内に形成されエンジン１を冷却するための図示しない冷却水通路と、この冷却水通路出口から冷媒加熱部である冷媒加熱器９、冷却水切替弁１１３、冷却水ポンプ１１４を順次流れ、上記冷却水通路入口に戻る第１冷却水回路１１１と、上記冷却水通路出口からラジエータ１１５、冷却水切替弁１１３、冷却水ポンプ１１４を順次流れ、上記冷却水通路入口に戻る第２冷却水回路１１２とから構成されている。

【００２１】ここで、冷却水ポンプ１１４は電動ポンプであり、冷却水切替弁１１３は第１冷却水回路１１１と第２冷却水回路１１２とを切り替える電磁切替弁である。また、ラジエータ１１５は冷却水と外気とを熱交換する周知の熱交換器であり、冷媒加熱器９は、例えば金属等からなる２重管式の熱交換器であり冷却水と冷媒とが熱交換可能になっている。また、上記冷却水通路の出入口と各部材９、１１３～１１５は例えばゴムホース等によって連結されている。

【００２２】上記構成を有するヒートポンプ式空調装置１００において、各構成要素のうち室内熱交換器４及び室内機電動弁５は、室内機２００を構成して室内の適所に設置され、その他のものは、室外機３００を構成して室外の適所に設置されている。

【００２３】そして、ヒートポンプ式空調装置１００は、電子回路等からなる制御手段として制御装置（図示せず）を有し、この制御装置は、図示しない室内に設けられたコントローラ、図示しない外気温センサ・冷媒温度センサ・水温センサ等からの情報を入力し、室内機２００及び室外機３００を作動制御するようになっている。

【００２４】次に、本実施形態の要部の構成を説明する。室内熱交換器４及び室外熱交換器８と室内機電動弁５及び室外機電動弁７との間に冷媒の気液分離手段としてレシーバ６を設けている。そして、そのレシーバ６内

で分離されて上部に溜まるガス冷媒を、冷房時の室内機電動弁５の出口側及び暖房時の室外機電動弁７の出口側から圧縮機２の吸入側までの低圧部分に流通させる均圧回路２０としての冷媒配管部分を設けている。

【００２５】実際にはレシーバ６の上面部と、冷房時も暖房時も冷媒の流れ方向が同じとなる四方弁３の下流から液冷媒を溜められるようアキュームレータ１０の上流までの間とを冷媒配管でつないでいる。また、その均圧回路２０内に回路の開閉手段としての均圧用電磁弁２１を設けている。

【００２６】次に、本実施形態の作動を上記構成に基づいて説明する。制御装置は、ヒートポンプ式空調装置１００に電力供給されている時には、図示しないコントローラからの情報に基づいて、暖房運転時の制御処理、又は冷房運転時の制御処理のいずれかを実行する。

【００２７】まず、暖房運転時の作動について説明する。例えば外気温が低い時、図示しないコントローラの暖房スイッチがＯＮされ、ＯＮ信号が制御装置に入力されると、制御装置は暖房運転時の制御処理を実行する。制御装置は四方弁３を暖房側（実線）に切り替えるとともに、エンジン１を起動し圧縮機２を駆動する。また、室内機電動弁５を全開にすると共に、室外機電動弁７を膨張弁として機能する開度に調節する。

【００２８】圧縮機２を出た高温のガス冷媒は、四方弁３を通り、室内熱交換器４で凝縮することで暖房を行なった後、レシーバ６で気液分離され、液冷媒が室外機電動弁７で減圧され、室外熱交換器８で蒸発し、四方弁３を再び通り、続いて冷媒加熱器９で、エンジン排熱を回収した冷却水との熱交換により加熱された後、アキュームレータ１０にて気液分離され、ガス冷媒が圧縮機２に戻る。

【００２９】エンジン１の起動に合わせて、冷却水ポンプ１１４も起動され、冷却水切替弁１１３は冷却水が第１冷却水回路１１１に流れる方向に切り替えられる。冷却水ポンプ１１４によって圧送された冷却水は、エンジン１内の冷却水通路を流れ、エンジン排熱を吸熱した後、冷媒加熱器９に入り、ここで、室外熱交換器８で蒸発した冷媒と熱交換して冷媒を加熱する。その後、冷却水切替弁１１３から冷却水ポンプ１１４に戻り、再びエンジン１内の冷却水通路に送られる。

【００３０】このように冷却水が循環するため、エンジン１の排熱は冷却水に回収され、冷媒加熱器９にて冷媒の加熱に利用されて、ヒートポンプ式空調装置１００の暖房熱源の一部となる。

【００３１】次に、冷房運転時の作動について説明する。例えば外気温が高い時、図示しないコントローラの冷房スイッチがＯＮされ、ＯＮ信号が制御装置に入力されると、制御装置は冷房運転時の制御処理を実行する。制御装置は四方弁３を冷房側（破線）に切り替えると共に、エンジン１を起動し圧縮機２を駆動する。また、室外機電動弁７を全開にすると共に、室内機電動弁５を膨張弁として機能する開度に調節する。

【００３２】圧縮機２を出た高温のガス冷媒は、四方弁３を通り、室外熱交換器８で凝縮し、レシーバ６で気液分離され、液冷媒は室内機電動弁５で減圧され、室外熱交換器８で蒸発することで冷房を行なった後、四方弁３を再び通り、続いて冷媒加熱器９からアキュームレータ１０に送られ、アキュームレータ１０にて気液分離され、ガス冷媒が圧縮機２に戻る。

【００３３】エンジン１の起動に合わせて、冷却水ポンプ１１４も起動され、冷却水切替弁１１３は冷却水が第２冷却水回路１１２に流れる方向に切り替えられる。冷却水ポンプ１１４によって圧送された冷却水は、エンジン１内の冷却水通路を流れ、エンジン排熱を吸熱した後、ラジエータ１１５に入る。その後、冷却水切替弁１１３から冷却水ポンプ１１４に戻り、再びエンジン１内の冷却水通路に送られる。

【００３４】このように冷却水が循環するため、エンジン１の排熱は冷却水に回収され、ラジエータ１１５にて外気と熱交換して放熱される。そして、上記の構成と作動により、エンジン１を停止させたり、電磁クラッチで駆動力を切るなりして、圧縮機２を停止させ、冷凍サイクル内の冷媒循環を停止した場合には均圧用電磁弁２１を開いて冷凍サイクル装置内を均圧させるものである。

【００３５】このように、高圧側に冷媒の気液分離手段６を設け、そこで分離された高圧ガス冷媒だけを低圧側に抜くことで、低圧側の液冷媒量を増やすことなく均圧を行なっている。これにより、アキュームレータ１０を大型化することなく、均圧後の圧縮機２起動時の液圧縮を防止することができる。

【００３６】また、その気液分離手段６にレシーバを用いている。これにより、従来と同様の冷凍サイクル構成機器を用いて均圧回路２０の高圧側の取り出し部をレシーバ上部とするだけで、アキュームレータを大型化することなく、均圧後の圧縮機起動時の液圧縮を防止することができる。

【００３７】また、このような均圧回路２０を第１、第２熱交換器を室内熱交換器４及び室外熱交換器８としたヒートポンプ式空調装置に用いている。これにより、アキュームレータ１０を大型化することなく、均圧後の圧縮機２起動時にも液圧縮を起こすことのない空調装置とすることができる。

【００３８】（その他の実施形態）上記実施形態では、気液分離手段６にレシーバを用いているが、本発明はこれに限らず、均圧回路２０専用の気液分離装置装置として設けても良い。また、エンジン駆動のヒートポンプ式空調装置であったが、ヒートポンプ式空調装置以外の冷媒圧縮式冷凍サイクルに適用してもよい。また、圧縮機２は電動圧縮機等のエンジン駆動以外のものであっても良いし、水や不凍液等のブライン（熱交換媒体）を加熱

する給湯装置等に適用しても良い。

【図面の簡単な説明】

【図１】本発明の一実施形態におけるヒートポンプ式空調装置の構成を示す模式図である。

【図２】従来の一実施形態におけるヒートポンプ式空調装置の構成を示す模式図である。

【符号の説明】

２　圧縮機

４　室内熱交換器（暖房時の第１熱交換器、冷房時の第２熱交換器）

５　室内機電動弁（冷房時の減圧手段）

６　レシーバ（気液分離手段）

７　室外機電動弁（暖房時の減圧手段）

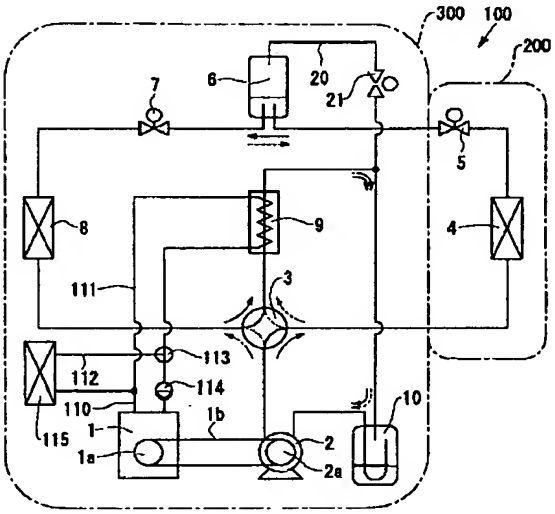
８　室外熱交換器（冷房時の第１熱交換器、暖房時の第２熱交換器）

１０　アキュームレータ

３０　均圧回路

３１　均圧用電磁弁（開閉手段）

【図１】



【図２】